

# The Value of a Higher ACT Exam Score

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## College Entrance Exams

- ▶ Entrance exams are an integral aspect of the college admissions process
  - ▶ 1.78 million graduating students take the ACT annually
  - ▶ 2.20 million graduating students take the SAT annually
- ▶ Students spend significant time and money practicing, preparing, and retaking exams to improve college placement
- ▶ This required preparation has led to concerns that the test score process disadvantages low-income and underrepresented minority students

### **What is the value of obtaining a higher score on the ACT/SAT?**

- ▶ Specifically, how much does scoring one point higher on the ACT impact your likelihood of attending a four-year college?
- ▶ To do this, we need to split the impact of scoring one point higher on the ACT into the causal effect of entrance exams and the correlation with unobservable factor (e.g. GPA, letters of recommendation, essays, etc.)
- ▶ Policy relevant question: If certain students (e.g. high-income students) are able to hire tutors and take test-prep classes that increase their ACT scores by one or two points, how does that translate into college-going rates and the quality of colleges attended?

# Preview of the Results

## Main result

- ▶ The causal impact of scoring 1 point higher on the ACT increases the likelihood that a student attends a four-year college by 1.17 percentage points (or 2.25 percent)

## Other results

- ▶ Attend higher quality schools
  - ▶ Higher average parental income
  - ▶ Higher graduation rates
  - ▶ Higher average student income
- ▶ Less likely to retake the ACT or attend a two-year college
- ▶ Limited impact on overall college attendance and graduation
- ▶ Fairly similar results by gender, race, and income

## **ACT Data**

- ▶ Includes the ACT scores of all students who graduated in 2011 and 2012
- ▶ 3.3 million students
- ▶ Includes information on composite and subscores
- ▶ Includes scores for each attempt at the ACT

## **College Data**

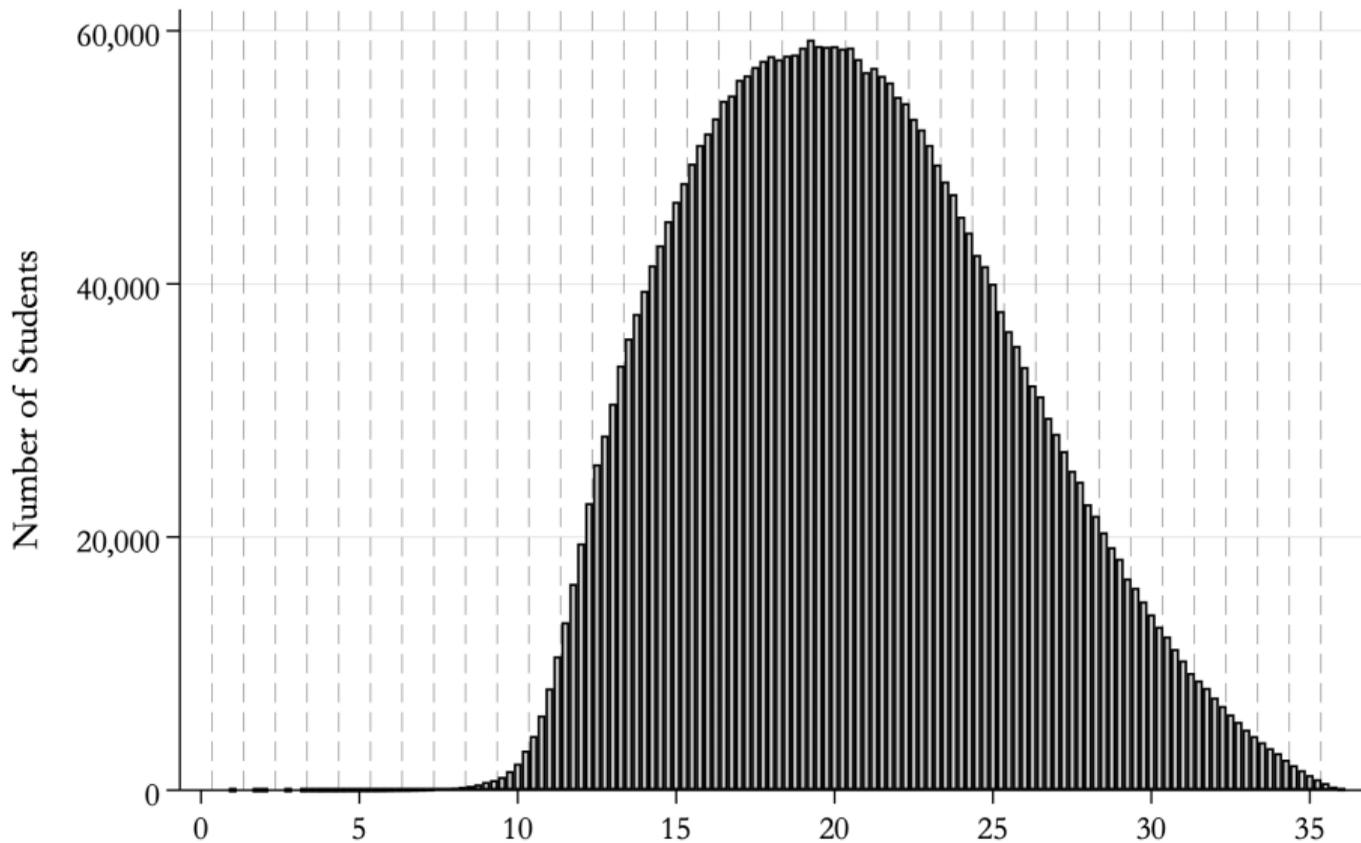
- ▶ ACT data is merged with National Student Clearing House data
- ▶ Provides information on college attended and graduation
- ▶ Also merged with college quality data from Chetty et al. (2020)

# Summary Statistics

## Panel A: Individual Characteristics of ACT Test Takers

	Mean	Std Dev	N
Family Income < 50,000	0.48	0.50	2,407,446
White	0.60	0.49	3,289,129
Black	0.14	0.34	3,289,129
Asian	0.04	0.20	3,289,129
Hispanic	0.13	0.34	3,289,129
Female	0.78	4.85	3,289,129
C GPA and Below (Less than 2.3)	0.30	0.46	2,951,347
B GPA (2.3 – 3.3)	0.28	0.45	2,951,347
A GPA (3.3 – 4)	0.41	0.49	2,951,347
Mother's Education: More than HS	0.68	0.47	2,065,394
Father's Education: More than HS	0.62	0.49	1,998,563
Went To College	0.83	0.38	3,289,129
Went To Four Year College	0.60	0.49	3,289,129
Went To Less Than Four Year College	0.22	0.41	3,289,129
Retook ACT	0.43	0.50	3,289,129
First Composite ACT Score	20.62	5.07	3,289,129
Max Composite ACT Score	21.29	5.25	3,289,129
Graduated College	0.51	0.50	3,289,129
BA or more	0.43	0.49	3,289,129
Assoc. Degree or More	0.49	0.50	3,289,129

# ACT Score Distribution



**The methodology uses a Regression Discontinuity Design along with the unique way the ACT composite score is calculated**

- ▶ Students' composite ACT score is the simple average of individual subscores across four subjects (English, math, reading, and science)
  - ▶ Both the composite and subscores range from 0 to 36
- ▶ This creates a discontinuity where the composite score jumps to the next whole number when rounding occurs.

## Example

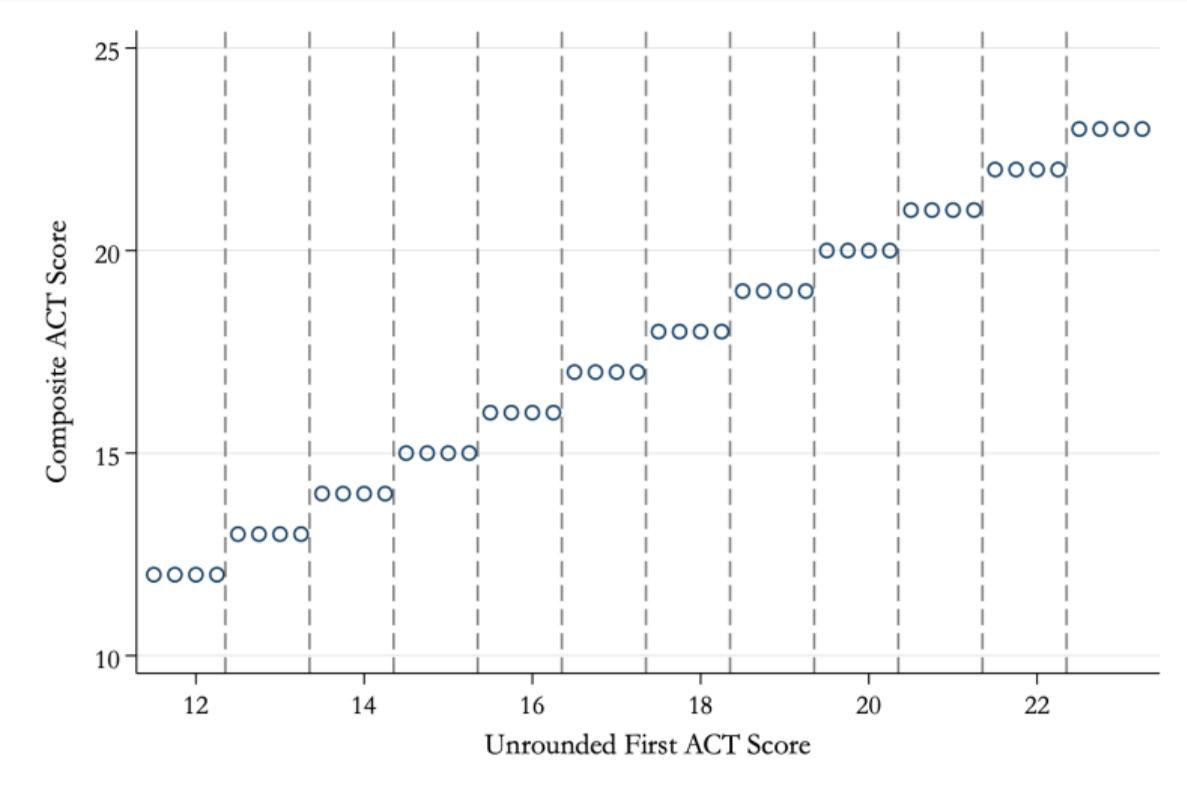
### Lucky Student

- ▶ Subscores: Math (24), English (24), Science (25), Reading (25)
- ▶ Unrounded composite score:  $(24 + 24 + 25 + 25)/4 = 24.5$
- ▶ Composite score: 25

### Unlucky Student

- ▶ Subscores: Math (24), English (24), Science (24), Reading (25)
- ▶ Unrounded composite score:  $(24 + 24 + 24 + 25)/4 = 24.25$
- ▶ Composite score: 24

# Composite ACT Score by Unrounded ACT Score

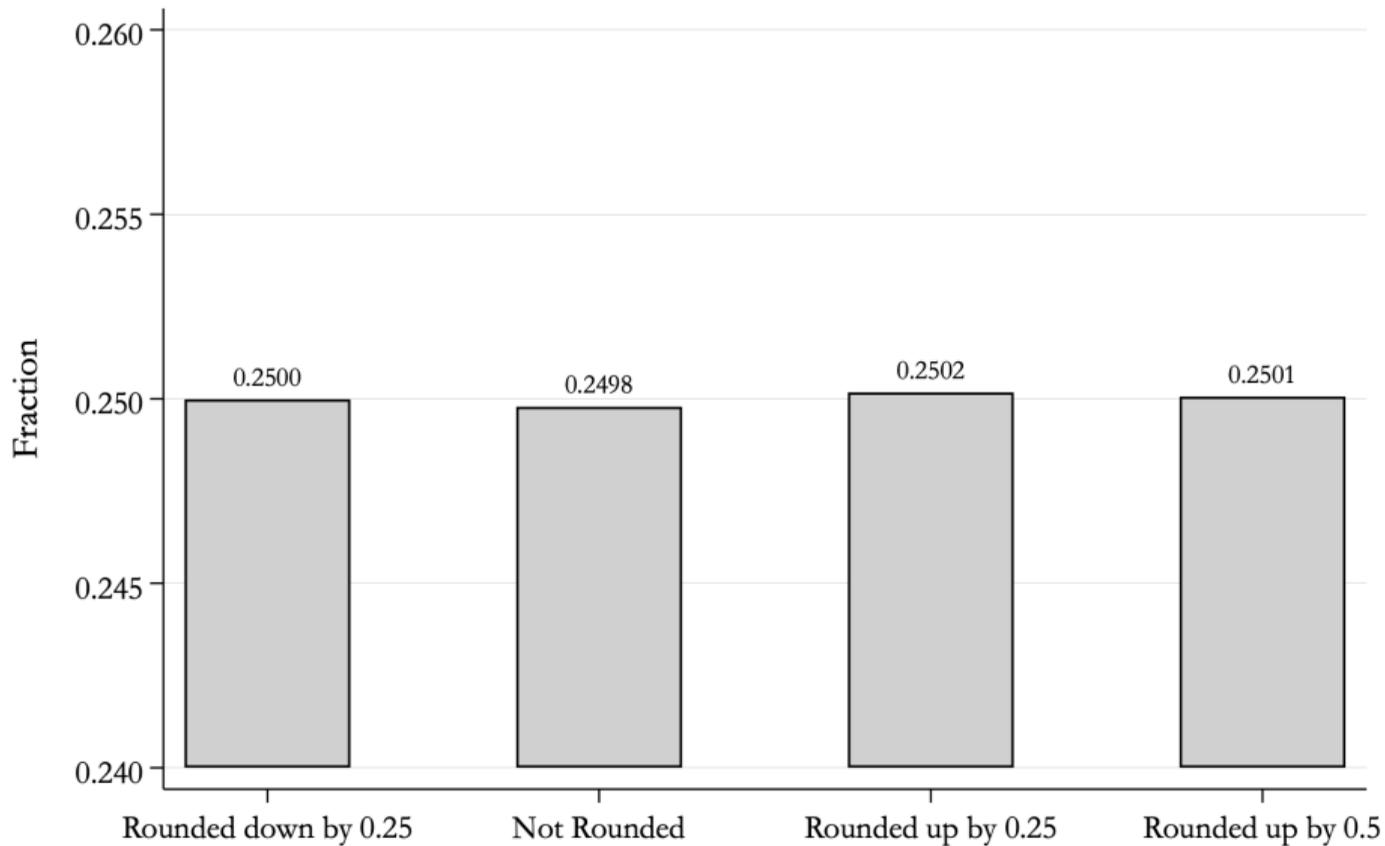


## Assumption

**This methodology compares the change in student outcomes between 24.5 and 24.25 (when rounding matters) relative to the change between 24.25 to 24.0 (when rounding doesn't matter)**

- ▶ Assumption 1: Students are unable to manipulate the test so they are more likely fall right above the cutoff
- ▶ Assumption 2: Students right above and below the cutoff have similar unobservables (i.e. GPA, essays, etc.)

# Test for Bunching



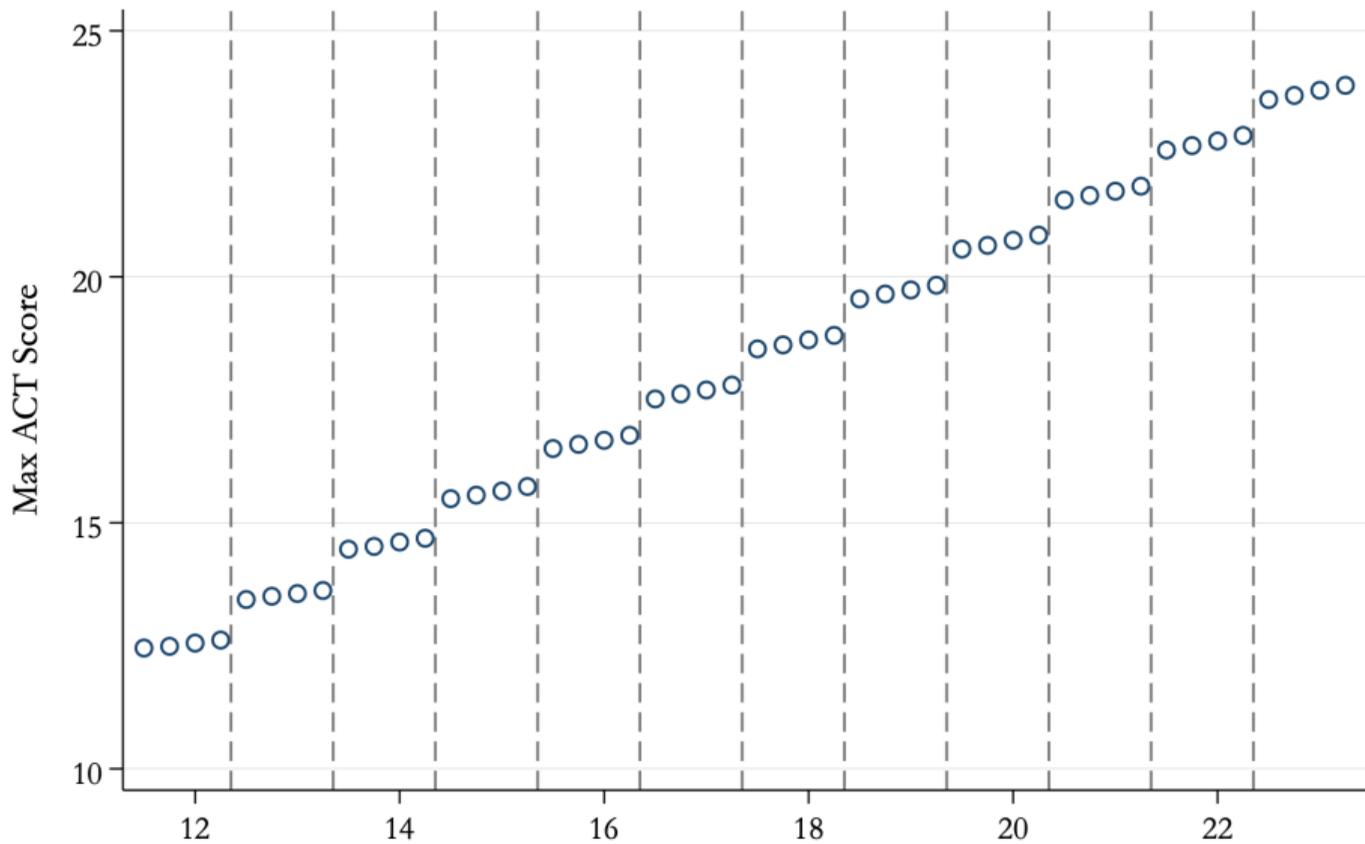
## Estimation Equation

Control for the unrounded ACT score and estimate the impact of being rounded up one ACT point

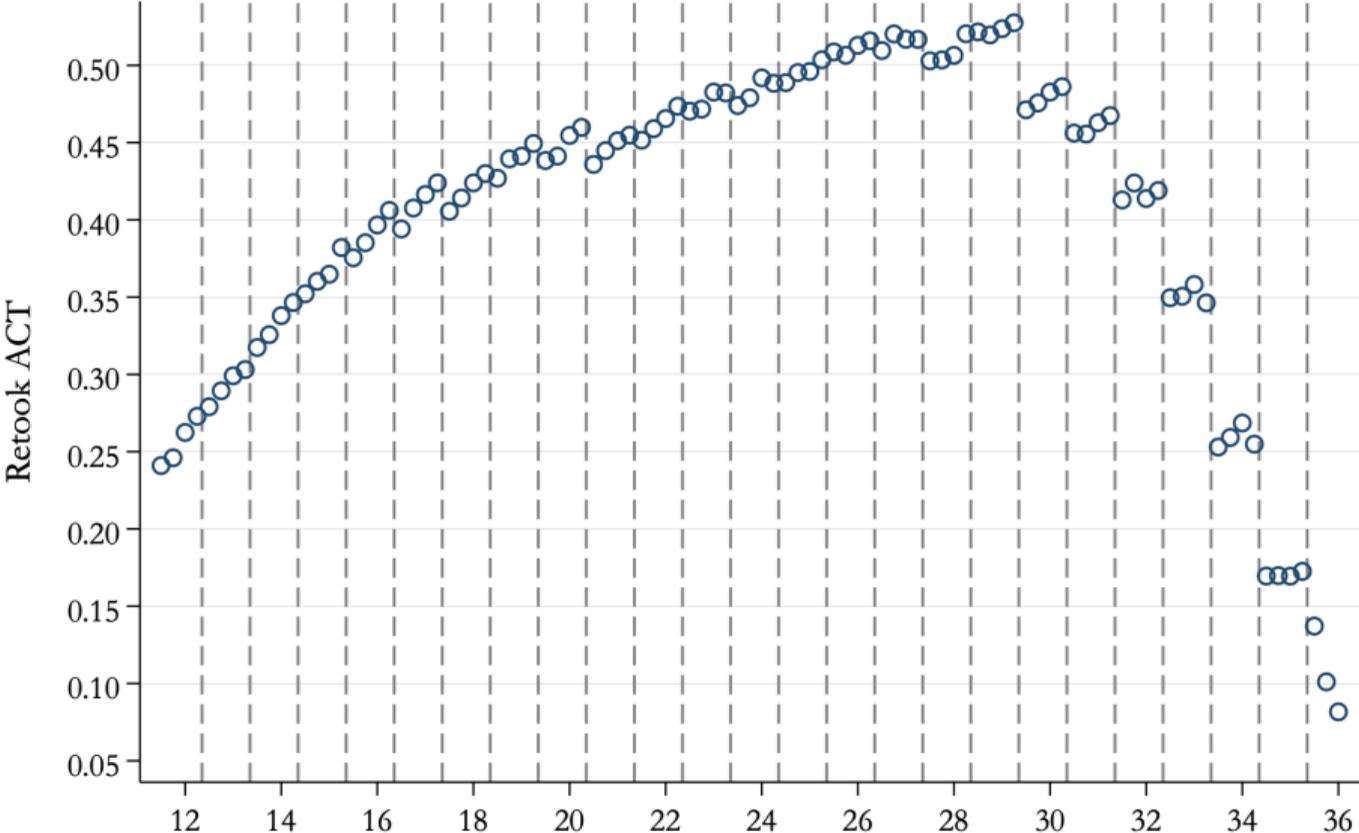
$$\text{AttendFourYearCollege}_i = \beta \text{RoundedUp}_i + \lambda f(\text{UnroundedScore}_i) + \theta X_i + \epsilon_i$$

- ▶ Measures of  $\text{RoundedUp}_i$ 
  - ▶ Composite score or binary variable for each decimal place
- ▶ Functions for  $f()$ 
  - ▶ Linear, 5th degree polynomial, or spline
- ▶ Control variables  $X_i$ 
  - ▶ Parent's income and education, race/ethnicity, gender, HS GPA, gender, and state

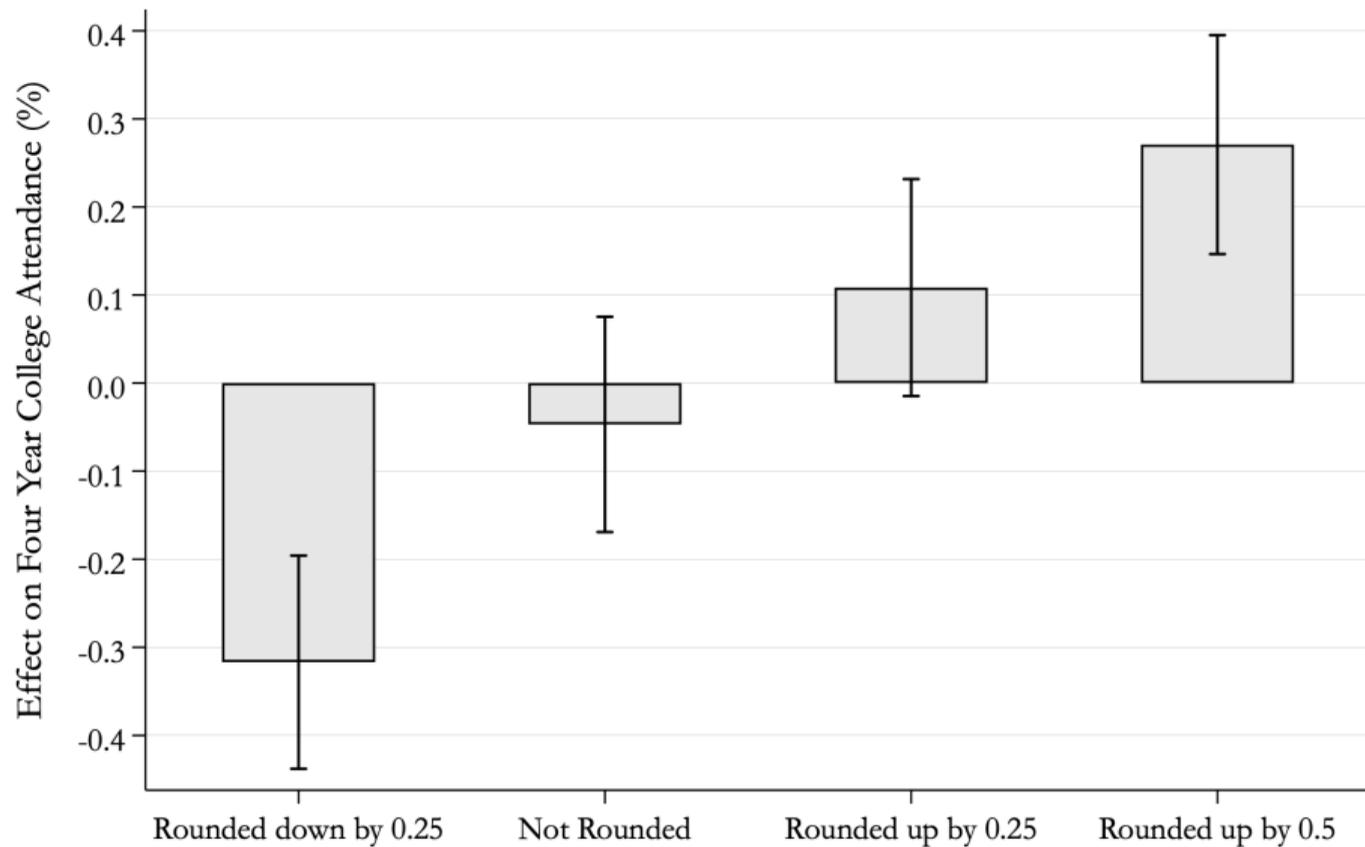
# Max Score



# Retook Exam

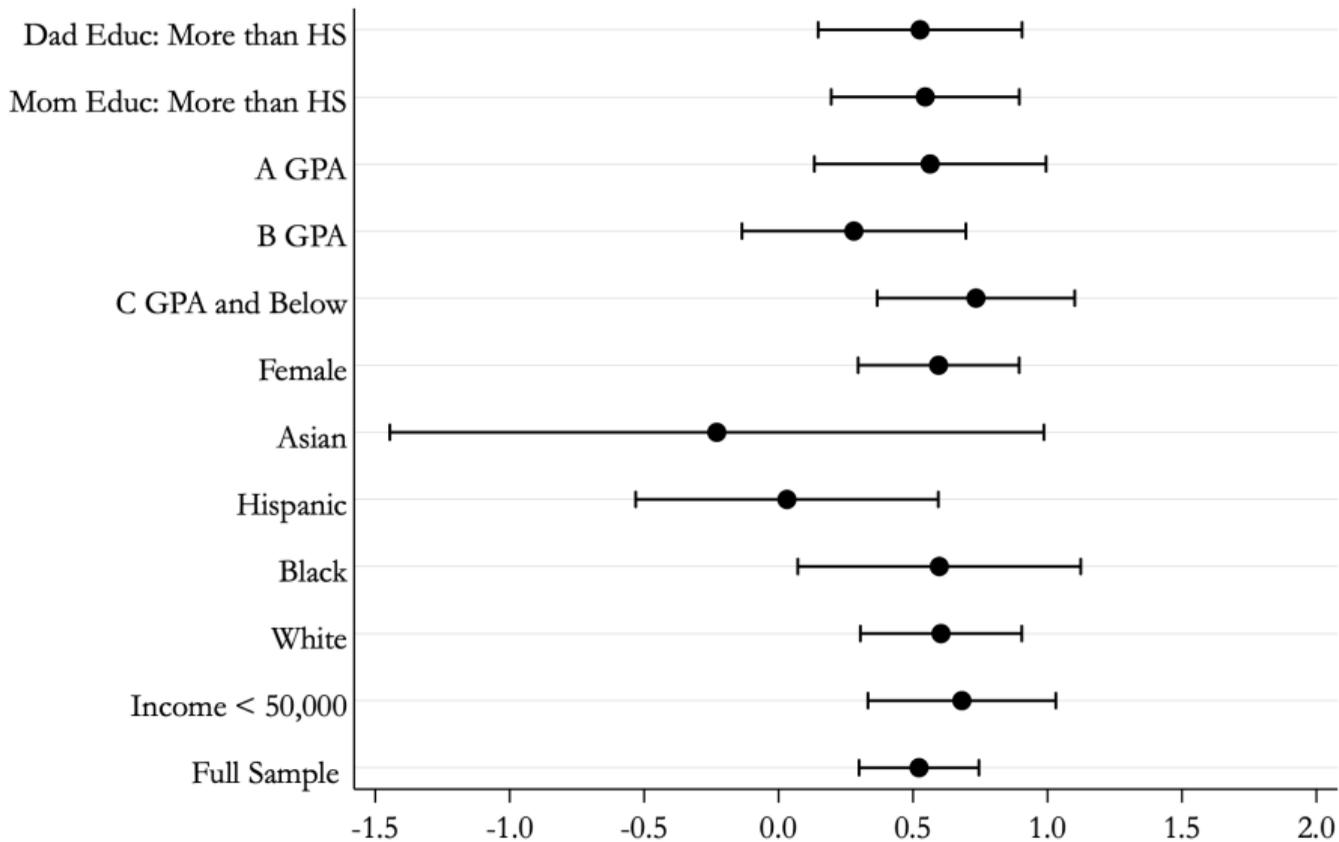


# Main Result





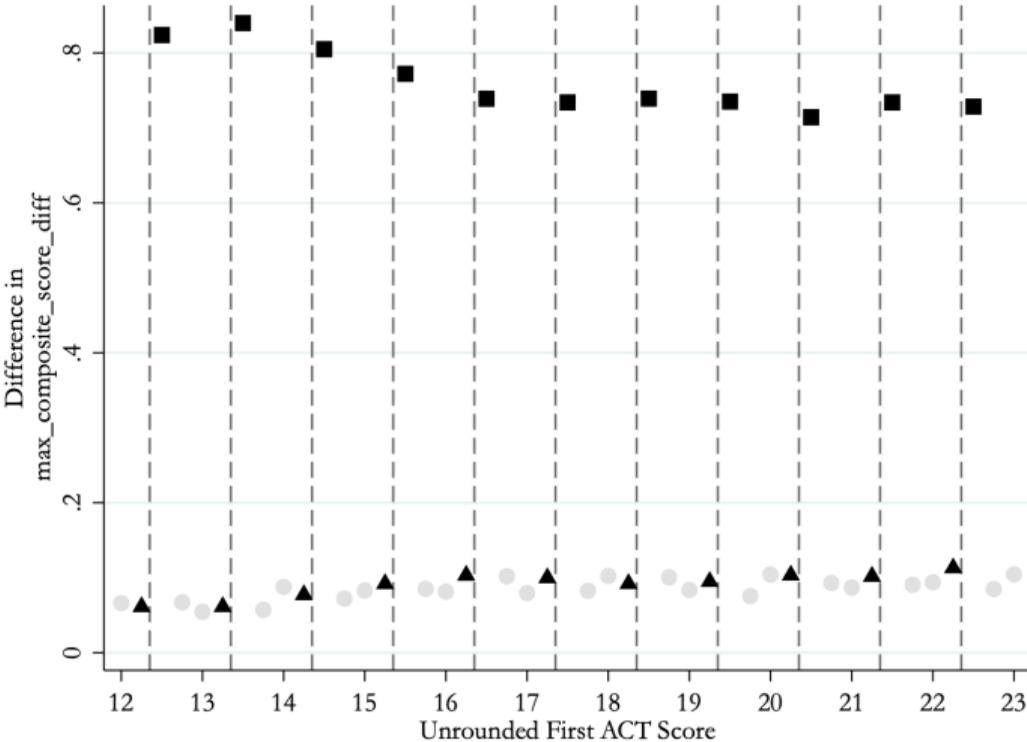
# Heterogeneity



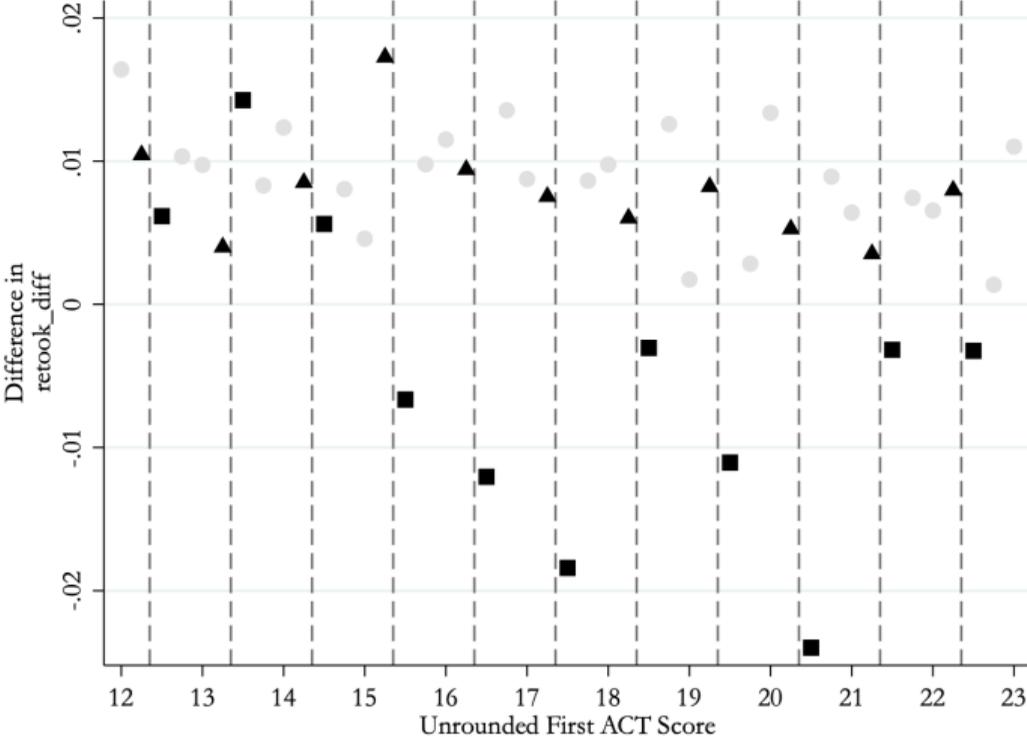
**Table 2:** Impact of Rounded ACT Score on Placebo Outcomes

	Income < 50k (1)	White (2)	Black (3)	Female (4)	GPA=A (5)	Mom: BA+ (6)	Dad: BA+ (7)
Composite ACT Score	-0.0008 (0.0013)	-0.0021* (0.0011)	0.0008 (0.0009)	-0.0096 (0.0126)	-0.0015 (0.0010)	0.0020 (0.0013)	-0.0000 (0.0013)
N	1,733,259	2,311,157	2,311,157	2,311,157	2,057,422	1,485,619	1,428,251
$R^2$	0.07	0.09	0.08	0.00	0.13	0.04	0.05
Mean of Dep. Var.	0.55	0.55	0.17	0.84	0.27	0.29	0.27

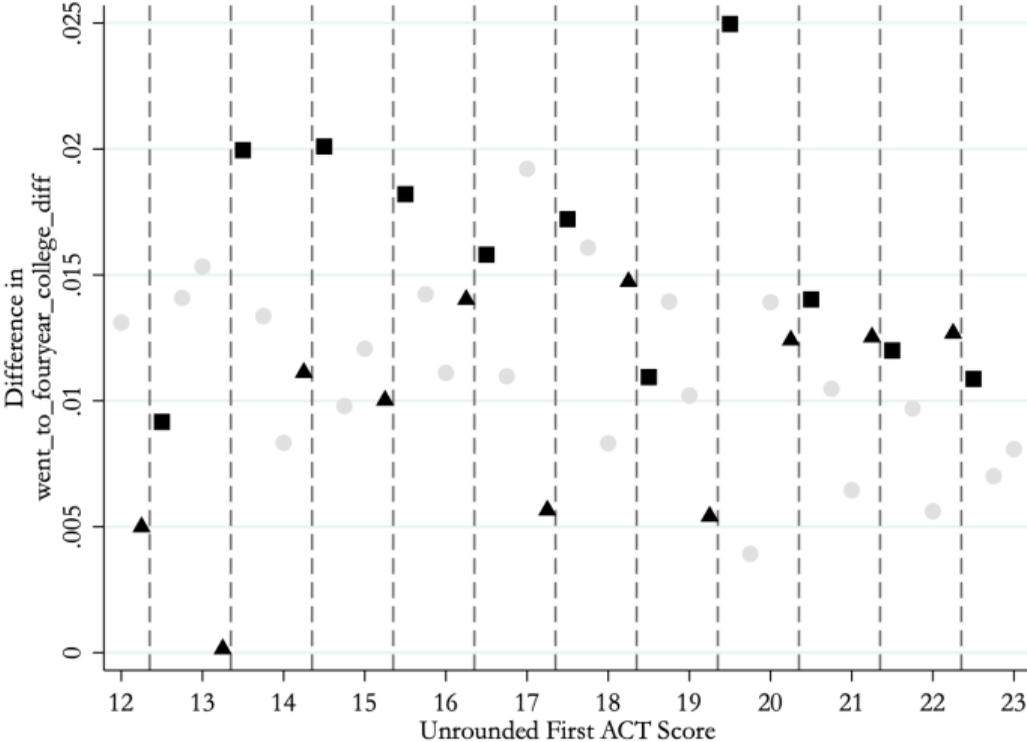
# Difference-in-Differences Approach: Max Composite Score



# Difference-in-Differences Approach: Retook ACT



# Difference-in-Differences Approach: Four-Year College



## Conclusion

- ▶ Individual Level: Students and parents who are trying to decide how much time and money to spend on test preparation classes or to retaking the ACT should compare the cost of doing so to the benefits that we document
- ▶ Broader Implication 1: Our results speak to the size of the advantage that students with better access to test preparation materials (tutors, classes, etc.) have over their peers
- ▶ Broader Implication 2: Our results speak to how test scores can mechanically play a role in the admissions process and are not just a proxy for student background and ability

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